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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/934,791	08/21/2001	Larry A. Coldren	510015-272	8573

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GREENBERG TRAURIG LLP
2450 COLORADO AVENUE, SUITE 400E
SANTA MONICA, CA 90404

EXAMINER

NGUYEN, PHILLIP

ART UNIT PAPER NUMBER

2828

DATE MAILED: 08/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/934,791

Applicant(s)

COLDREN ET AL.

Examiner

Phillip Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other:

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 07/16/2003 has been entered.

The amendment filed on July 17, 2003 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 16, and 31 fail to define a structure of the heat spreading layers such that heat generated by VCSEL can bypass the reflecting surfaces.

Claim 1 also recites in lines 6-7 "at least one thermally conductive InP heat spreading layer" which is lack of antecedence basis.

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Claims 12 and 27 fail to provide a method step to reduce the temperature in the VCSEL. The claims only recite the ability of the device to so perform; hence, it does not constitute a limitation in any patentable sense.

Claims 14 and 29 recite "a thickness of about $1-3\lambda$ to the at least one heat spreading layer" which is not clear because the claims fail to define λ .

Claims 15 and 30 fail to provide a method step that reduce the temperature of the device. The claims instead provide a step of fabricating the device by "providing a mixture to selectively etch the active layer".

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-4, 7-8, 11-12, 16-19, 22-23, 26-27, and 31 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Ramdani et al. ('103), ~~Uchida ('560), or Jayaraman ('686)~~.

With respect to claim 31, Ramdani discloses in Figure 1 a VCSEL comprising a first and a second reflecting surfaces 13 and 26 respectively; an active layer 23; a first and a second thermally conductive InP heat spreading layers 30 and 40, respectively.

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Claims 1 and 16 further recite methods for reducing the temperature in VCSEL. Since Ramdani disclose the product as recited in claim 31, it is inherent product by process for performing the methods as recited in the claims.

With respect to claims 2 and 17, Ramdani ('103) discloses the InP cladding layer 30 is doped with n+ type material ('col. 3, line 30).

With respect to claims 3 and 18, Ramdani discloses the claimed invention as shown in the rejections of claims 1 and 2.

With respect to claims 4 and 19, Ramdani disclose both of the reflecting surfaces comprising DBR.

With respect to claims 7-8 and 22-23, Ramdani also discloses the alloy of InAlGaAs/InGaAsP in active layer, substantially lattice matched to InP (col. 1, lines 38-40).

With respect to claims 11 and 26, Ramdani further discloses the VCSEL device including undoped DBR (col. 3, lines 18-21).

With respect to claims 12 and 27, it is inherent that the device disclosed by Ramdani can perform a continuous wave at 80 degree in Celsius because it has all the structures required.

5. Claims 1, 4, 9-10, 14, 16, 19, 24-25, 29, and 31, are rejected under 35 U.S.C. 102(b) as being anticipated by Uchida ('560).

With respect to claim 31, Uchida discloses in Figure 2 a VCSEL comprising a first and a second reflecting surfaces 102 and 107 respectively; an active layer 104; a first and a second thermally conductive InP heat spreading layers 103 and 105, respectively.

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Claims 1 and 16 further recite methods for reducing the temperature in VCSEL. Since Uchida discloses the product as recited in claim 31, it is inherent product by process for performing the methods as recited in the claims.

With respect to claims 4 and 19, Uchida disclose both of the reflecting surfaces comprising DBR.

With respect to claims 14 and 29, Uchida discloses the thickness of the heat spreading layers of 1.5 microns which can be set equal to $1-3\lambda$.

With respect to claims 9-10 and 24-25, Uchida discloses the DBR including alternating layers of $\text{Al}_{a1}\text{Ga}_{1-a1}\text{As}_b\text{Sb}_{1-b}$ and $\text{Al}_{a2}\text{Ga}_{1-a2}\text{As}_b\text{Sb}_{1-b}$ wherein b is greater than about 0.5, $a1$ is greater than about 0.9, and $a2$ is less than about 0.3 (col. 9, lines 10-27 and col. 10, line 7).

6. Claims 1, 5, 13, 16, 20, 28, and 31 are rejected under 35 U.S.C. 102(b) as being anticipated by Jayaraman ('686).

With respect to claim 31, Jayaraman discloses in Figure 1 a VCSEL comprising a first and a second reflecting surfaces 12 and 24 respectively; an active layer 18; a first and a second thermally conductive InP heat spreading layers 16 and 20, respectively.

Claims 1 and 16 further recite methods for reducing the temperature in VCSEL. Since Jayaraman discloses the product as recited in claim 31, it is inherent product by process for performing the methods as recited in the claims.

With respect to claims 5, 13, and 20, 28, Jayaraman discloses in Figure 6 a tunnel junction between an apertured active layer and the at least one of reflecting surfaces including InP and P-type InAlAs in the tunnel junction.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 6 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ramdani et al. ('103) in view of Choquette et al. ('577). Ramdani discloses the claimed invention except for having InAlGaAs material in the active layer, substantially lattice matched to InP. Choquette discloses in Figure 1 a VCSEL device having InAlGaAs in the active layer wherein the device includes at least one thermally conductive InP heat spreading layer 32 between at least one reflecting surface 14/16 and an active layer 30. For the improvement of the VCSEL device, it would have been obvious to the one having ordinary skill in the art at the time the invention was made to provide InAlGaAs which has lattice matched to InP as taught by Choquette besides InGaAsP and InGaAs.

9. Claims 15 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ramdani et al. ('103) in view of Tsao et al. ('294). Ramdani discloses the claimed invention except for a mixture to etch the active layer and heat-spreading layer in the tunnel junction. Tsao discloses a method of reducing the temperature in the VCSEL (col. 4, lines 7-9). For the improvement of the VCSEL device, it would have been obvious to the one having ordinary skill in the art at the time the invention was made to provide a mixture to selectively etch the active

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layer and at least one heat spreading layer as taught by Tsao to reduce the temperature in the VCSEL.

Citation of Pertinent References

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The patent to Ramdani et al. discloses Long Wavelength VCSEL , U.S. Patent No. 5732103

The patent to Uchida discloses Multi-Layer, Mirror of Compound Semiconductors Including Nitrogen and Surface Light Emitting Device with the Same , U.S. Patent No. 6057560

The patent to Jayaraman discloses Process for Manufacturing VCSELs Using Patterned Wafer Fusion and the Device Manufactured by the Process, U.S. Patent No. 5985686

The patent to Choquette et al. discloses Efficient Semiconductor Light-Emitting Device and Method , U.S. Patent No. 5493577

The patent to Tsao et al. discloses Segmented-Mirror VCSEL , U.S. Patent No. 6594294

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Communication Information

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phillip Nguyen whose telephone number is 703-305-4966. The examiner can normally be reached on Monday to Friday from 8:30 AM to 5:30 PM

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Ip, can be reached on (703) 308-3098. The fax phone numbers for the organization where this application or proceeding is assigned are:


TC2800 Official Before-Final RightFAX - (703) 872-9318

TC2800 Official After-Final RightFAX - (703) 872-9319

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0658.

August 10th, 2003

PN, AU 2828


QUYEN LEUNG
PRIMARY EXAMINER

fd
SOPC Paul Ip